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GEOPHYSICAL VARIABLES AND BEHAVIOR: LXXV. POSSIBLE INCREASED INCIDENCE OF BRAIN TUMORS FOLLOWING AN EPISODE OF LUMINOUS PHENOMENA[1]

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Summary.—If the tectonic strain theory for luminous phenomena be correct, then significant electromagnetic emissions and radon gas release should occur in focal regions in which people report an alleged "UFO flap." Considering the epidemiological evidence that these stimuli might promote the incidence of brain tumors, their occurrence during the 5 years before and the 5 years after the November, 1975 episode of multiple luminous displays within the Sudbury Basin (Canada) was examined. Compared to the adjacent control area, there was a significant increase in brain tumors after the episode for men (conservative odds ratio = 2.5) but not for women; however, the magnitude was well within the expected range of incidence within the general population. Such changes have theoretical implication but may have little clinical or health significance.

The tectonic strain theory (TST) states that most luminous displays, now described as unidentified flying objects, are natural phenomena; they are generated by extremely local and brief strain fields that accompany increasing earth stresses (7). Intense, less visible electromagnetic fields and radon gas emissions, two classes of stimuli that commonly precede regional earthquakes (1, 8), have been hypothesized to occur frequently in active or "flap" regions (4). In light of the epidemiological pattern that brain tumors might be (a) directly promoted by exposure to power frequency magnetic fields (2) and (b) indirectly facilitated by radon gas exposure (3), Persinger (5) suggested that incidence of brain tumors would increase within regions in which a significant UFO flap had occurred.

During early November, 1975 the Sudbury Basin was exposed to a "UFO flap"; multiple luminous phenomena were reported by the population and detected by the local radar station. As suggested by the concurrence of other unusual forces during that month (6), the conditions of the tectonic strain continuum (4) had been satisfied. If the postulated physical forces were involved, then the incidence of brain tumors should have increased during the five years that followed the November event relative to changes within adjacent control regions.

To test this hypothesis, numbers of brain tumors (ICD-191 and 192) for the Sudbury region (which included the city, district, and municipality) and within an adjacent (reference) region (which contained about twice the popu-

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lation) were obtained from a provincial registry for the 10 years before and after 1975. The numbers of brain tumors for men and women between 20 and 59 years of age were extracted. We reasoned that men should have been more mobile and would have investigated odd lights (close proximity) while women would have had less opportunity to implement these options. The total numbers of brain tumors during 1971 through 1975 (5 yr.) were compared with the numbers of tumors for the 5-yr. interval from 1976 through 1980 for the men and women of the two areas. To assess whether the year 1975 was an actual point of inflection, the numbers of tumors for both gender and districts were obtained for the additional 5-yr. intervals before 1971 and after 1980.

Chi-squared analyses were completed (SPSS software on a Vax 4000 computer) for potential disconcordance of incidence for the 5 years before and after 1975, the two 5-yr. intervals before 1975, and the two 5-yr. intervals after 1975 for the two districts for men and women separately. Odds ratios were calculated by dividing the (absolute, i.e., not adjusted for population) number of tumors for an interval by that of the previous interval for the Sudbury Basin and then dividing this quotient by the ratio that was obtained for the control region. Data were then expressed as numbers of brain tumors per 100,000 (0.1 M) people for men and for women for each region (Statistics Canada) for the appropriate years.

There was a significant increase in malignant brain tumors for men ($\chi^2 = 6.39$, $p < .05$; $\phi = 0.30$) but not for women ($\chi^2 < 1.50$) in the Sudbury region relative to the reference area during the five years that followed the luminous displays relative to the five years that preceded this interval. For the men, the incidence per 0.1 M was 4.5 and 10.6, respectively, for 5-yr. periods before and after the luminous displays in Sudbury but 7.2 and 5.2 per 0.1 M for these periods in the control area (these yearly incidence rates are comparable to those for the general male population within this age range). For the women, the incidence rate before the luminous displays was 4.2 and 2.6 per 0.1 M in Sudbury and the control area and 6.9 and 5.1 per 0.1 M in these areas, respectively, during the subsequent period. There were no significant discrepancies between incidence of tumors for men or women between the two regions for the two successive 5-yr. intervals before 1975 or after 1975.

These results appear consistent with the hypothesis that a brief, localized display of luminous phenomena may be associated with enhanced emissions of electromagnetic fields and radon gas emission that facilitate tumorigenic processes. In this instance the incidence of malignant brain tumors, compared to the reference area, doubled following the 1975 episode. The increase was specific to this episode although the statistical significance was facilitated by the relative decrease in tumor incidence within the reference region.

Considering the estimated strength of the physical processes and the duration of the tectonic strain-related forces in this instance, the magnitude of the effect is within the expected range. However, the probability of spurious increases by confounding variables cannot be excluded. If our results are generalizable, then other areas exposed to a more maintained and intense flap (e.g., Uinta Basin, Utah 1967 to 1971; Yakima, Washington 1975 to 1979; Carman, Manitoba 1976 to 1980; Medjugorje, Yugoslavia 1986 to 1990; Zeitoun, Egypt 1969 to 1973) might have displayed still larger incidence rates during these specified periods.

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